



Enhancing the Vision for Managing California's Environmental Information

Environmental Data Summit Organizing Committee

Problem Statement

The Delta is a microcosm of California's environmental challenges and associated management decisions that are greater in complexity and magnitude than our data can adequately inform. Though we have ample data, they are housed in isolated silos that limit their applicability. Decision-makers and the public expect well-integrated, holistic, and transparent solutions.

The Charge to the Delta Science Program:

“Only a synthetic, integrated, analytical approach to understanding the effects of suites of environmental factors [stressors] on the ecosystem and its components is likely to provide important insights that can lead to the enhancement of the Delta and its species.”

National Research Council, 2012

Vision with a Purpose

Our work is to establish a vision that can be broadly shared among agency, NGO, tribal, academic, and public stakeholders. By fostering principled consensus, we wish to demonstrate that California has a broad plan for addressing its environmental data management challenges, thereby fostering a collaborative, fundable package of solutions that can be implemented over a sustained period of time with minimal disruption to established processes.

Benefits of Our Vision

For Agencies:

- A much clearer measure of the value of data, as they are used more synthetically and easily traced to decision-making
- An engaged and innovative technical staff
- Steadier funding for technology infrastructure
- Continued leverage over respective agency data while also employing data “beyond the silo”

Benefits of Our Vision

For Scientists and Decision-Makers:

- Easier access to the best available, most timely data
- Stronger data visualizations to aid in decisions and communication to public stakeholders
- Increased collaboration opportunities
- Greater confidence in the fulfillment of data-sharing mandates

Benefits of Our Vision

For the public stakeholders:

- Data resources are more easily discoverable and accessible
- Investments in data collection can be transparently measured and compounded through cooperative relationships
- Greater confidence in the integrity of natural resource decisions
- Greater confidence in the responsible innovation of the public sector

A Shared Vision

We collectively propose a productive and sustainable balance of centralized and decentralized technologies to leverage creative solutions while increasing coordination and shared standards:

- The adoption of a federated data model (centralized and decentralized)
- Implementation of shared data and metadata standards (centralized)
- The promotion of open-source solutions (decentralized)
- The use of web services (decentralized)

Challenges to Data Integration

- Evolving expectations for “transparency”:
 - In the past, “transparency” was defined as publishing a PDF with embedded information
 - Then “transparency” consisted of issuing a CD upon request
 - Now, downloading a data file suffices for most agencies
 - However, researchers, policy-makers, and the public expect computer servers to communicate machine-to-machine, without delay, to
 - Analyze data
 - Aggregate data
 - Integrate data from various sources
 - Visually represent the data

Challenges to Data Integration

- Evolving expectations for “transparency”
- Varying data quality standards and documentation
 - Given the heterogeneity of environmental data, standards are challenging to implement
 - But the environmental challenges we face require increased documentation and coordination
 - Any comprehensive solution will rely on documented data and metadata standards

Challenges to Data Integration

- Evolving expectations for “transparency”
- Varying data quality standards and documentation
- **Narrow use of proprietary technology**
 - Limits integration potential
 - Limits the forms of technology solutions
 - Out of step with established trends

Challenges to Data Integration

- Evolving expectations for “transparency”
- Varying data quality standards and documentation
- Narrow use of proprietary solutions
- **Lack of cooperation and coordination**
 - Each agency has its own data silo(s)
 - Addressing matters such the drought, climate change, or endangered species requires synthetic, collaborative solutions

A Path Forward

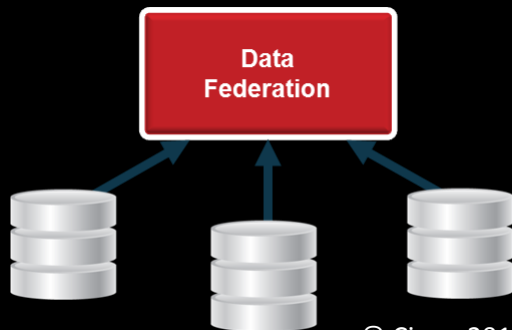
- Adopt a federated data model

Data Federation

Data federation offers collective power while preserving individual agency mandates

Standards-based approach

Agencies would retain autonomy but could also achieve greater coordination and deeper insights



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Federation would require an incremental implementation: evolution over revolution

A Path Forward

- Adopt a federated data model
- Promote and document metadata standards

A Path Forward

- Adopt a federated data model
- Promote and document metadata standards
- Embrace open-source software whenever practical

Open-Source Software

Adopt evolutionary rather than revolutionary change



Geoportal Server



Embrace open-source software



Open source software

- is cost-effective
- attracts the best talent to serve as solution co-creators
- Offers reproducibility within a scientific context
- can integrate into a proprietary solution via a hybrid design

The evolutionary, incremental approach

A Path Forward

- Adopt a federated data model
- Promote and document data standards
- Embrace open-source software whenever practical
- **Require data management plans for all data acquired**

A Path Forward

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- Promote and document data standards
- Embrace open-source software whenever practical
- Require data management plans for all data acquired
- Embrace data of different quality, resolution, sources, as long as attributes are documented

A Path Forward

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- Embrace data of different quality, resolution, sources, as long as attributes are documented
- **Develop and use web services for data sharing**

Progress to Date

- Presented to the California Water Quality Monitoring Council
 - CWQMC recognized deep alignment with their own goals and endorsed the vision
- Will continue to share the still-unpublished vision with strategic partners
- Will be made available for public review in Late December for publication in January
- Can then be leveraged to share with other state, federal, corporate, and philanthropic partners



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Questions?

Rainer Hoenicke

rainer.hoenicke@deltacouncil.ca.gov

Governance Along the Path

Empower a task force to address the many gaps in the state's business model and standards documentation

- Lack of clearly communicated value proposition:
Perform inventory analysis
- Lack of understanding of user needs:
Identify needs, usage patterns, and likely future outlook
- Perceived redundancy of services and products:
Perform cost-benefit analysis
- Insufficient resources:
Recommend funding model
- Ineffective coordination:
Implement common data standards

Governance Along the Path

Pursue Funding opportunities

The funding model should seek opportunities to overcome budgetary constraints through, for example:

- Public-private partnerships
- Technology innovation fund
- Grant funding
- Federal program partnerships
- Identifying fiduciary agents for grants